

Figure 1 consists of 12 subplots, labeled (a) through (l), each showing the time course of a different physiological parameter over a 12-hour period. The x-axis for all plots is 'Time (h)' ranging from 0 to 12. The y-axis for each plot represents the parameter value. The parameters and their approximate values are as follows:

- (a) HR (b/min): Starts at ~100, drops to ~80 by 2h, then fluctuates between 80 and 100.
- (b) RR (1/min): Starts at ~18, drops to ~15 by 2h, then fluctuates between 15 and 20.
- (c) SpO<sub>2</sub> (%): Starts at ~95, drops to ~90 by 2h, then fluctuates between 90 and 95.
- (d) MAP (mmHg): Starts at ~90, drops to ~70 by 2h, then fluctuates between 70 and 80.
- (e) CVP (mmHg): Starts at ~10, drops to ~8 by 2h, then fluctuates between 8 and 10.
- (f) PIP (cmH<sub>2</sub>O): Starts at ~20, drops to ~15 by 2h, then fluctuates between 15 and 20.
- (g) PEEP (cmH<sub>2</sub>O): Starts at ~5, drops to ~3 by 2h, then fluctuates between 3 and 5.
- (h) V<sub>t</sub> (ml/kg): Starts at ~10, drops to ~8 by 2h, then fluctuates between 8 and 10.
- (i) P<sub>a</sub>O<sub>2</sub> (mmHg): Starts at ~100, drops to ~80 by 2h, then fluctuates between 80 and 100.
- (j) P<sub>a</sub>O<sub>2</sub>/F<sub>i</sub>O<sub>2</sub> (mmHg): Starts at ~100, drops to ~80 by 2h, then fluctuates between 80 and 100.
- (k) PaO<sub>2</sub> (mmHg): Starts at ~100, drops to ~80 by 2h, then fluctuates between 80 and 100.
- (l) PaO<sub>2</sub>/F<sub>i</sub>O<sub>2</sub> (mmHg): Starts at ~100, drops to ~80 by 2h, then fluctuates between 80 and 100.

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**UTILITY  
PATENT APPLICATION  
TRANSMITTAL**

*(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))*

Attorney Docket No.	PP11US
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First Inventor or Application Identifier	Kia Silverbrook
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Title	EFFECTS MODULE FOR COMPACT PRINTER SYSTEM
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Express Mail Label No.

## APPLICATION ELEMENTS

*See MPEP chapter 600 concerning utility patent application contents*

**ADDRESS TO:** Assistant Commissioner for Patents  
Box Patent Application  
Washington, DC 20231

1. ☒ \* Fee Transmittal Form (e.g., PTO/SB/17)  
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 21]  
(preferred arrangement set forth below)
- Descriptive title of the Invention
  - Cross References to Related Applications
  - Statement Regarding Fed sponsored R & D
  - Reference to Microfiche Appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 12]
4. Oath or Declaration [Total Pages 3]
- a. ☒ Newly executed (original or copy)
  - b. ☐ Copy from a prior application (37 C.F.R. § 1.6  
(for continuation/divisional with Box 16 completed))
    - i. ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting  
inventor(s) named in the prior application  
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b)

5. ☐ Microfiche Computer Program (*Appendix*)
6. Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

### ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement ☐ Power of Attorney  
(when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure ☐ Copies of IDS  
Statement (IDS)/PTO-1449 Citations
11. ☐ Preliminary Amendment
12. ☐ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)
- \* Small Entity
13. ☒ Statement(s) ☐ Statement filed in prior application,  
(PTO/SB/09-12) Status still proper and desired
14. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)
15. ☐ Other: .....

\* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).


16. If a **CONTINUING APPLICATION**, check appropriate box, and supply the requisite information below and in a preliminary amendment:
- |                                       |                                     |   |  |
|---------------------------------------|-------------------------------------|---|--|
| <input type="checkbox"/> Continuation | <input type="checkbox"/> Divisional | <input type="checkbox"/> Continuation-in-part (CIP) | of prior application No. _____ / _____ |
|---------------------------------------|-------------------------------------|---|--|

Prior application information: Examiner \_\_\_\_\_ Group / Art Unit: \_\_\_\_\_  
**For CONTINUATION or DIVISIONAL APPS only:** The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

## 17. CORRESPONDENCE ADDRESS

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Signature		Date	May 16, 2000

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**STATEMENT CLAIMING SMALL ENTITY STATUS  
(37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN**

Docket Number (Optional)  
PP11US

Applicant, Patentee, or Identifier: Silverbrook Research Pty Ltd

Application or Patent No.: \_\_\_\_\_

Filed or Issued: May, 2000

Title: EFFECTS MODULE FOR COMPACT PRINTER SYSTEM

I hereby state that I am

- ☒ the owner of the small business concern identified below:  
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN Silverbrook Research Pty. Ltd.

ADDRESS OF SMALL BUSINESS CONCERN 393 Darling Street, Balmain, NSW 2041, Australia

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☒ the specification filed herewith with title as listed above.  
☐ the application identified above.  
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

- Each person, concern, or organization having any rights in the invention is listed below:  
☒ no such person, concern, or organization exists.  
☐ each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF PERSON SIGNING Kia Silverbrook

TITLE OF PERSON IF OTHER THAN OWNER \_\_\_\_\_

ADDRESS OF PERSON SIGNING 393 Darling Street, Balmain, NSW 2041, Australia

SIGNATURE  DATE May 16, 2000

## EFFECTS MODULE FOR COMPACT PRINTER SYSTEM

### FIELD OF THE INVENTION

The invention relates to an effects module useful in a digital imaging system. It is useful for applying effects to images prior to printing in a compact printer system able to print full-color, business card size documents from a device about the size of a pen.

Reference may be had to co-pending applications claiming priority from Australian Provisional Patent Application number PQ0560 dated 25 May 1999. The co-pending applications describe related modules and methods for implementing the compact printer system. The co-pending applications are as follows:

USSN	Docket No.	Title
TBA	PP01	Compact Color Printer Module
TBA	PP02	Modular Compact Printer System
TBA	PP03	Nozzle Capping Mechanism
TBA	PP04	Ink Cartridge for Compact Printer System
TBA	PP07	Controller for Printer Module
TBA	PP08	Camera Module for Compact Printer System
TBA	PP09	Image Processor for Camera Module
TBA	PP10	Memory Module for Compact Printer System
TBA	PP12	Effects Processor for Effects Module
TBA	PP13	Timer Module for Compact Printer System
TBA	PP15	Color Conversion Method for Compact Printer System
TBA	PP16	Method and Apparatus of Dithering
TBA	PP17	Method and Apparatus of Image Conversion

### BACKGROUND OF THE INVENTION

Microelectronic manufacturing techniques have led to the miniaturization of numerous devices. Mobile phones, personal digital assistant devices, and digital cameras are very common examples of the miniaturization trend.

One device that has not seen the advantage of microelectronic manufacturing techniques is the printer. Commercially available printers are large compared to many of the devices they could support. For instance, it is impractical to carry a color printer for the purpose of instantly printing photographs taken with known compact digital cameras.

A compact printhead has been described in co-pending United States Patent Applications filed simultaneously to the present application and hereby incorporated by cross reference:

USSN	Docket No.	Title
TBA	MJ62	Fluidic seal for an ink jet nozzle assembly
TBA	IJ52	Ink jet printhead having a moving nozzle with an externally arranged actuator
TBA	IJM52	Method of manufacture of an ink jet printhead having a moving nozzle with an externally arranged actuator
TBA	MJ63	Ink jet printhead nozzle array
TBA	MJ58	Nozzle guard for an ink jet printhead

It is known in some compact devices such as cameras to provide on-board processing to apply effects such as labels, for example the time and date. It is even known to have facility to produce custom labels, although these are normally only simple text. The problem with these known devices is that they are very limited in the range of effects provided. Furthermore, they are built in to the device and are therefore fixed. A more versatile approach to memory devices is desirable.

#### SUMMARY OF THE INVENTION

In one form, the invention resides in an effects module comprising:  
a body;  
an image processor within said body that applies one or more effects to a stored image;  
at least one connection means incorporated in said body for connecting said effects module to a bus providing power and data between said effects module and said stored image.

In a further form the invention resides in an effects module for a compact printer system comprising:  
a body;  
an image processor within said body that applies one or more effects to an image stored in a further module of said compact printer system;  
at least one connection means incorporated in said body for connecting said effects module to a bus providing power and data between said effects module and said further module.

In a still further form the invention resides in a method of applying one or more effects to a stored image in a compact printer system comprising the steps of: reading said stored image from a first storage location to an image processor;

applying a selected effect to said stored image;  
writing a resultant image to a second storage location.

Further features of the invention will be evident from the following description.

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## BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist with describing preferred embodiments of the invention, reference will be made to the following figures in which:

FIG 1 is a printer module;

10

FIG 2 is a camera module;

FIG 3 is a memory module;

FIG 4 is a communication module;

FIG 5 is a flash module;

FIG 6 is a timer module;

15

FIG 7 is a laser module;

FIG 8 is an effects module;

FIG 9 is a characters module;

FIG 10 is an adaptor module;

FIG 11 is a pen module;

20

FIG 12 is a dispenser module;

FIG 13 is a first compact printer configuration;

FIG 14 is a second compact printer configuration;

FIG 15 is a third compact printer configuration;

FIG 16 is a fourth compact printer configuration;

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FIG 17 is a perspective view of the effects module;

FIG 18 is an exploded view of the effects module; and

FIG 19 is a block schematic diagram of a central processor chip for the effects module.

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## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is described in terms of the application to a compact printer system. It will be understood that the invention is not limited to this particular application but rather can be employed with any digital imaging system. Nonetheless,

the compact printer system provides a convenient environment in which to describe the details of the effects module invention.

Referring to FIGs 1 to 12, there are shown various modules that together form a compact printer system. Individual modules can be attached and detached from the compact printer configuration to allow a user-definable solution to business-card sized printing. Images can also be transferred from one compact printer to another without the use of a secondary computer system. Modules have a minimal user-interface to allow straightforward interaction.

A compact printer system configuration consists of a number of compact printer modules connected together. Each compact printer module has a function that contributes to the overall functionality of the particular compact printer configuration. Each compact printer module is typically shaped like part of a pen, physically connecting with other compact printer modules to form the complete pen-shaped device. The length of the compact printer device depends on the number and type of compact printer modules connected. The functionality of a compact printer configuration depends on the compact printer modules in the given configuration.

The compact printer modules connect both physically and logically. The physical connection allows modules to be connected in any order, and the logical connection is taken care of by the compact printer Serial Bus - a bus that provides power, allows the modules to self configure and provides for the transfer of data.

In terms of physical connection, most compact printer modules consist of a central body, a male connector at one end, and a female connector at the other. Since most modules have both a male and female connector, the modules can typically be connected in any order. Certain modules only have a male or a female connector, but this is determined by the function of the module. Adaptor modules allow these single-connector modules to be connected at either end of a given compact printer configuration.

A four wire physical connection between all the compact printer modules provides the logical connection between them in the form of the compact printer Serial Bus. The compact printer Serial Bus provides power to each module, and provides the means by which data is transferred between modules. Importantly, the compact printer Serial Bus and accompanying protocol provides the means by which the compact printer system auto-configures, reducing the user-interface burden on the end-user.

Compact printer modules can be grouped into three types:

- image processing modules including a Printer Module (FIG 1), a Camera Module (FIG 2), and a Memory Module (FIG 3). Image processing modules are primarily what sets the compact printer system apart from other pen-like devices. Image processing modules capture, print, store or manipulate photographic images;
- housekeeping modules including an Adapter Module (FIG 10), an Effects Module (FIG 8), a Communications Module (FIG 4), and a Timer Module (FIG 6). Housekeeping modules provide services to other modules or extended functionality to other modules; and
- isolated modules including a Pen Module (FIG 11) and a Laser Module (FIG 7). Isolated modules are those that attach to the compact printer system but are completely independent of any other module. They do not necessarily require power, and may even provide their own power. Isolated Modules are defined because the functionality they provide is typically incorporated into other pen-like devices.

Although housekeeping modules and isolated modules are useful components in a compact printer system, they are extras in a system dedicated to image processing and photographic manipulation. Life size (1:1) illustrations of the compact printer modules are shown in FIGs 1 to 12, and example configurations produced by connecting various modules together are shown in FIGs 13 to 16.

FIG 1 shows a printer module that incorporates a compact printhead described in co-pending United States Patent Applications listed in the Background section of this application, incorporated herewith by reference, and referred to herewith as a Memjet printhead. The Memjet printhead is a drop-on-demand 1600 dpi inkjet printer that produces bi-level dots in up to 4 colors to produce a printed page of a particular width. Since the printhead prints dots at 1600 dpi, each dot is approximately  $22.5\mu\text{m}$  in diameter, and spaced  $15.875\mu\text{m}$  apart. Because the printing is bi-level, the input image should be dithered or error-diffused for best results. Typically a Memjet printhead for a particular application is page-width. This enables the printhead to be stationary and allows the paper to move past the printhead. A Memjet printhead is composed of a number of identical 1/2 inch Memjet segments.

The printer module 10 comprises a body 11 housing the Memjet printhead. Power is supplied by a three volt battery housed in battery compartment 12. The printhead is activated to commence printing when a business card (or similar sized

printable media) is inserted into slot 13. Male connector 14 and female connector 15 facilitate connection of other modules to the printer module 10.

FIG 2 shows a camera module 20. The camera module provides a point-and-shoot camera component to the compact printer system as a means of capturing images. The camera module comprises a body 21 having a female connector 22. A lens 23 directs an image to an image sensor and specialized image processing chip within the camera 24. A conventional view finder 25 is provided as well as a lens cap 26. An image is captured when the Take button 27 is pushed. Captured images are transferred to the Printer Module 10 for subsequent printing, manipulation, or storage. The Camera Module also contains a self-timer mode similar to that found on regular cameras.

FIG 3 shows a Memory Module 30 comprising a body 31, LCD 32, IN button 33, OUT button 34 and SELECT button 35. The Memory Module 30 is a standard module used for storing photographic images captured by the Camera 20. The memory module stores 48 images, each of which can be accessed either at full resolution or at thumbnail resolution. Full resolution provides read and write access to individual images, and thumbnail resolution provides read access to 16 images at once in thumbnail form.

The Memory Module 30 attaches to other modules via a female connector 36 or male connector 37. The male and female connectors allow the module to be connected at either end of a configuration. Power may be provided from the Printer Module 10 via the Serial Bus or from a separate power source, such as a power module.

A Communications Module 40 is shown in FIG 4. The communications module 40 consists of a connector 41 and a cable 42 that terminates in an appropriate connector for a computer port, such as a USB port, RS232 serial port or parallel port. The Communications Module 40 allows the compact printer system to be connected to a computer. When so connected, images can be transferred between the computer and the various modules of the compact printer system. The communications module allows captured images to be downloaded to the computer, and new images for printing to be uploaded into the printer module 10 and the memory module 30.

A Flash Module 50 is shown in FIG 5. The Flash Module 50 is used to generate a flash with flash cell 51 when taking photographs with the Camera Module 20. The Flash Module attaches to other modules via female connector 52 and male



connector 53. It contains its own power source. The Flash Module is automatically selected by the Camera Module when required. A simple switch allows the Flash Module to be explicitly turned off to maximize battery life.

FIG 6 shows a Timer Module 60 that is used to automate the taking of multiple photos with the Camera Module 20, each photo separated by a specific time interval. The captured photos are stored in Memory Module 30. Any flash requirements are handled by the Camera Module 20, and can therefore be ignored by the Timer Module. The Timer Module 60 consists of a body 61 housing a LCD 62, START/STOP button 63 and UNITS button 64. A SELECT button 65 allows the user to select time units and the number of units are set by UNITS button 64. The Timer Module 60 includes a male connector 66 and female connector 67. The Timer Module takes its power from the Printer Module 10 via the Serial Bus or from a separate power source, such as a power module.

A Laser Module 70 is shown in FIG 7. The Laser Module 70 consists of a body 71 containing a conventional laser pointer operated by button 72. As the Laser Module is a terminal module it only has one connector, which in the example is a male connector 73. The Laser Module is an isolated module, in that it does not perform any image capture, storage, or processing. It exists as a functional addition to the compact printer system. It is provided because laser pointer services are typically incorporated into other pen-like devices. The Laser Module contains its own power supply and does not appear as a device on the Serial Bus.

The Effects Module shown in FIG 8 is an image processing module. It allows a user to select a number of effects and applies them to the current image stored in the Printer Module 10 or other module having an image store. The effects include borders, clip-art, captions, warps, color changes, and painting styles. The Effects Module comprises a body 81 housing custom electronics and an optional LCD 82. The LCD is optional as data from the Effects Module can be transferred to another module for display. A CHOOSE button 83 allows a user to choose between a number of different types of effects. A SELECT button 84 allows the user to select one effect from the number of effects of the chosen type. Pressing the APPLY button 85 applies the effect to an image stored in memory in the Printer Module 10, the Memory Module 30 or any other module that stores an image. The Effects Module obtains power from the Serial Bus. Male connector 86 and female connector 87 allow the Effects Module to be connected to other compact printer system modules.

FIG 9 shows a Character Module 90 that is a special type of Effects Module (described above) that only contains character clip-art effects of a given topic or genre. Examples include The Simpsons®, Star Wars®, Batman®, and Dilbert® as well as company specific modules for McDonalds® etc. As such it is an image processing module. It consists of a body 91 housing custom electronics and a LCD 92. SELECT button 93 allows the user to choose the effect that is to be applied with APPLY button 94. The Character Module obtains power from the Serial Bus through male connector 95 and female connector 96.

The Adaptor Module 100, shown in FIG 10, is a female/female connector that allows connection between two modules that terminate in male connectors. A male/male connector (not shown) allows connection between two modules that terminate in female connectors. The Adaptor Module is a housekeeping module, in that it facilitates the use of other modules, and does not perform any specific processing of its own.

All “through” modules have a male connector at one end, and a female connector at the other end. The modules can therefore be chained together, with each module connected at either end of the chain. However some modules, such as the Laser Module 70, are terminating modules, and therefore have either a male or female connector only. Such single-connector modules can only be connected at one end of the chain. If two such modules are to be connected at the one time, an Adaptor Module 100 is required.

FIG 11 shows a Pen Module 110 which is a pen in a module form. It is an isolated module in that it attaches to the compact printer system but is completely independent of any other module. It does not consume or require any power. The Pen Module is defined because it is a convenient extension of a pen shaped, pen sized device. It may also come with a cap 111. The cap may be used to keep terminating connectors clean in the case where the chain ends with a connector rather than a terminating module.

To assist with accurately feeding a business card sized print media into slot 13 of the printer module 10, a dispenser module 120 is provided as shown in FIG12. The dispenser module 120 comprises a body 121 that holds a store of business card sized print media. A Printer Module 10 locates into socket 122 on the dispenser module

120. When correctly aligned, a card dispensed from the dispenser module by slider 123 enters slot 13 and is printed.

In the sense that a minimum configuration compact printer system must be able to print out photos, a minimum compact printer configuration contains at least a Printer Module 10. The Printer Module holds a single photographic image that can be printed out via its Memjet printer. It also contains the 3V battery required to power the compact printer system.

In this minimum configuration, the user is only able to print out photos. Each time a user inserts a business card 130 into the slot in the Printer Module, the image in the Printer Module is printed onto the card. The same image is printed each time a business card is inserted into the printer. In this minimum configuration there is no way for a user to change the image that is printed. The dispenser module 120 can be used to feed cards 130 into the Printer Module with a minimum of fuss, as shown in FIG 13.

By connecting a Camera Module 20 to the minimum configuration compact printer system the user now has an instant printing digital camera in a pen, as shown in FIG 14. The Camera Module 20 provides the mechanism for capturing images and the Printer Module 10 provides the mechanism for printing them out. The battery in the Printer Module provides power for both the camera and the printer.

When the user presses the "Take" button 27 on the Camera Module 20, the image is captured by the camera 24 and transferred to the Printer Module 10. Each time a business card is inserted into the printer the captured image is printed out. If the user presses "Take" on the Camera Module again, the old image in the Printer Module is replaced by the new image.

If the Camera Module is subsequently detached from the compact printer system, the captured image remains in the Printer Module, and can be printed out as many times as desired. The Camera Module is simply there to capture images to be placed in the Printer Module.

FIG 15 shows a further configuration in which a Memory Module 30 is connected to the configuration of FIG 14. In the embodiment of FIG 15, the user has the ability to transfer images between the Printer Module 10 and a storage area contained in the Memory Module 30. The user selects the image number on the Memory Module, and then either sends that image to the Printer Module (replacing whatever image was already stored there), or brings the current image from the Printer

Module to the specified image number in the Memory Module. The Memory Module also provides a way of sending sets of thumbnail images to the Printer Module.

Multiple Memory Modules can be included in a given system, extending the number of images that can be stored. A given Memory Module can be disconnected from one compact printer system and connected to another for subsequent image printing.

With the Camera Module 20 attached to a Memory Module/Printer Module compact printer system, as shown in FIG 15, the user can "Take" an image with the Camera Module, then transfer it to the specified image number in the Memory Module. The captured images can then be printed out in any order.

By connecting a Communications Module 40 to the minimum configuration compact printer system, the user gains the ability to transfer images between a PC and the compact printer system. FIG 16 shows the configuration of FIG 15 with the addition of a Communications Module 40. The Communications Module makes the Printer Module 10 and any Memory Modules 30 visible to an external computer system. This allows the download or uploading of images. The communications module also allows computer control of any connected compact printer modules, such as the Camera Module 20.

Each module is visible on the Serial Bus. Each module is self identifying and self-configuring using standard USB protocols. Apart from the standard protocol functions (including identification), there are a number of functions to which each module is also capable of responding. These are outlined in Table 1. Each module also has a number of module-specific functions. These commands allow the modules to be controlled by an external device, such as a personal computer, and by other modules.

Table 1. Basic Module Functions	
Name	Description
GetImageCounts()	Returns two counts - the number of images that can be read from the module, and the number of images that can be written to the module. This allows read only, write only, and virtual read only images.
GetCurrentImageNumber	If the module has a setting for the image number, this call returns the current image number.
GetImageAccessMethods	Returns two sets of 8 access bits. The first set represents the read access bits, and the second set represents the write access bits. See Table 2 for an interpretation of the bits.

GetImage(N, Mode)	Returns image number N using the specified 8-bit access mode. See Table 3 for an interpretation of the access mode bits.
StoreImage(N, Mode)	Stores an image at address N using the specified 8-bit access mode. See Table 3 for an interpretation of the access mode bits.
TransferImage(N1, Mode, Dest, N2)	Transfers the image at address N1 using the specified 8-bit access mode to the image at address N2 at the serial device with id Dest. See Table 3 for an interpretation of the access mode bits.

The 8-bit mode returned by GetImageAccessMethods is interpreted as follows:

Table 2. 8-bit return code from GetImageAccessMethods	
Bit	Interpretation
0	Access 850 x 534 permitted
1	Access 534 x 850 permitted
2	Interleaved L*a*b* permitted
3	Planar L*, a*, b* permitted
4-7	Reserved, and 0

The 8-bit mode used for image read and write access via GetImage, StoreImage and TransferImage is interpreted as follows:

Table 3. 8-bit code used for read & write access	
Bit	Interpretation
0	Orientation: 0 = 850 x 534, 1 = 534 x 850
1	0 = interleaved, 1 = planar
2-3	Color plane (valid only when bit 1 = planar) 00 = L*, 01 = a*, 10 = b*, 11 = reserved
4-7	Reserved, and 0

In some situations, certain modules may be configured without the printer module. For example, it may be convenient to configure a camera module 20 and a memory module 30 for capturing and storing images for later printing by the printer module 10. The timer module 60 and the flash module 50 may be added to the camera module 20 and memory module 30 to produce a digital camera having many of the features of a conventional camera. Additional memory modules can easily be added to provide virtually unlimited memory storage. An Effects Module may be added to apply effects to stored images for later printing.

The above commands allow images to be transferred to and from the modules without going through the printer module. For example, the Memory Module 30 can

act under control of the Timer Module 60 to transfer a captured image from the Camera Module 20 to the Memory Module 30 using the TransferImage command. The Camera Module 20 will have a module specific 'capture' command for capturing an image. The Effects Module will have module specific commands for applying selected effects to an image.

In the general case, the Printer Module holds the "current" image, and the other modules function with respect to this central repository of the current image. The Printer Module is therefore the central location for image interchange in the compact printer system, and the Printer Module provides a service to other modules as specified by user interaction.

A given module may act as an image source. It therefore has the ability to transfer an image to the Printer Module. A different module may act as an image store. It therefore has the ability to read the image from the Printer Module. Some modules act as both image store and image source. These modules can both read images from and write images to the Printer Module's current image.

The standard image type has a single conceptual definition. The image definition is derived from the physical attributes of the printhead used in the Printer Module. The printhead is 2 inches wide and prints at 1600dpi in cyan, magenta and yellow bi-level dots. Consequently a printed image from the compact printer system is 3200 bi-level dots wide.

The compact printer system prints on business card sized pages (85mm x 55mm). Since the printhead is 2 inches wide, the business cards are printed such that 1 line of dots is 2 inches. 2 inches is 50.8mm, leaving a 2mm edge on a standard business-card sized page. The length of the image is derived from the same card size with a 2mm edge. Consequently the printed image length is 81mm, which equals 5100 1600dpi dots. The printed area of a page is therefore 81mm x 51mm, or 5100 x 3200 dots.

To obtain an integral contone to bi-level ratio a contone resolution of 267 ppi (pixels per inch) is chosen. This yields a contone CMY page size of 850 x 534, and a contone to bi-level ratio of 1:6 in each dimension. This ratio of 1:6 provides no perceived loss of quality since the output image is bi-level.

The printhead prints dots in cyan, magenta, and yellow ink. The final output to the printed page must therefore be in the gamut of the printhead and take the attributes of the inks into account. It would at first seem reasonable to use the CMY color space

to represent images. However, the printer's CMY color space does not have a linear response. This is definitely true of pigmented inks, and partially true for dye-based inks. The individual color profile of a particular device (input and output) can vary considerably. Image capture devices (such as digital cameras) typically work in RGB (red green blue) color space, and each sensor will have its own color response characteristics.

Consequently, to allow for accurate conversion, as well as to allow for future image sensors, inks, and printers, the CIE  $L^*a^*b^*$  color model [CIE, 1986, CIE 15.2 Colorimetry: Technical Report (2<sup>nd</sup> Edition), Commission Internationale De l'Eclairage] is used for the compact printer system.  $L^*a^*b^*$  is well defined, perceptually linear, and is a superset of other traditional color spaces (such as CMY, RGB, and HSV).

The Printer Module must therefore be capable of converting  $L^*a^*b^*$  images to the particular peculiarities of its CMY color space. However, since the compact printer system allows for connectivity to PCs, it is quite reasonable to also allow highly accurate color matching between screen and printer to be performed on the PC. However the printer driver or PC program must output  $L^*a^*b^*$ .

Each pixel of a compact printer image is therefore represented by 24 bits: 8 bits each of  $L^*$ ,  $a^*$ , and  $b^*$ . The total image size is therefore 1,361,700 bytes (850 x 534 x 3).

Each image processing module is able to access the image stored in the Printer Module. The access is either to read the image from the Printer Module, or to write a new image to the Printer Module.

The communications protocol for image access to the Printer Module provides a choice of internal image organization. Images can be accessed either as 850 x 534 or as 534 x 850. They can also be accessed in interleaved or planar format. When accessed as interleaved, each pixel in the image is read or written as 24 bits: 8 bits each of  $L^*$ ,  $a^*$ ,  $b^*$ . When accessed as planar, each of the color planes can be read or written independently. The entire image of  $L^*$  pixels,  $a^*$  pixels or  $b^*$  pixels can be read or written at a time.

The Effects Module 80 is an image processing module. It allows a user to select a number of effects and applies them to the current image in the Printer Module 10. The effects include borders, clip-art, captions, warps, color changes, and painting styles.

FIG 17 shows a magnified perspective view of the Effects Module 80, as previously described with reference to FIG 8. As shown in FIG 17, the optional LCD 82 is showing all segments active. It is convenient to include the LCD in the module but as all data can be available on the serial bus it would be possible to configure a single LCD module that could display information from any module.

FIG 18 shows an exploded view of the Effects Module 80. The Effects Module comprises a LCD 82 mounted on a flexible printed circuit board (PCB) 300. Also formed on the PCB 300 is an image processor that is suitably an application specific integrated circuit known as the Effects Module Central Processor (EMCP) 350.

The SELECT button 84 is a double button and operates in the manner of a known rocker switch to increment or decrement the effect number. Selections made using the SELECT button 84 are communicated to the PCB 300 via contact 301.

The flexible PCB 300 is mounted on a support 303 of chassis molding 302. In the preferred embodiment the PCB 300 is mounted such that the LCD 82 lies substantially parallel with a front face 304 of the support 303. The flexible PCB 300 passes over the support such that the EMCP 350 lies substantially parallel with a back face 305 of the support 303. The flexible PCB 300 passes under the EMCP and extends away from the base 306 of the chassis molding 302.

The contact 301 conforms to a curved edge of the support 303 allowing the base of SELECT button 84 to lie substantially parallel with a side face 310 of the support.

The male bayonet connector 86 comprises a cap molding 307, a latch strip 308 and a plurality of contact strips 309. The upper end of the cap molding is essentially dome-shaped and comprises two holes 311 positioned diametrically opposite each other. The holes 311 are positioned and shaped to receive the folded ends 312 of latch strip 308.

The lower end of the cap molding 307 comprises an elongated section 313 that is shaped to carry contact strips 309. The contact strips extend from the upper end of the cap molding, where they form part of the male connector 86, to the bottom of the elongated section 313. The bottom of the elongated section fits into a recess 314 in the base 306 of the chassis molding such that the contact strips 309 form part of the female bayonet connector 87.



Raised portions 315 of the contact strips 309 fit into an aperture 316 in the elongated section 313 of the cap molding. Contacts on the flexible PCB 300 mate with the raised portions 315 to make contact with the Serial Bus.

The CHOOSE button 83 and the APPLY button 85 are incorporated in a molding 317. A contact in the base of the molding for each button connects with the PCB 300 when one or other of the buttons is pressed.

The internal components of the Effects Module 80 are contained within a metal extrusion 318 that comprises a plurality of apertures. It is clear from FIG 18 the manner in which the buttons 83, 84 and 85, and the male connector 86 protrude from the extrusion through the associated apertures to perform their function.

A fascia molding 319 clips into the aperture 320 and provides a protective cover for the LCD 82.

The Effects Module 80 connects to a compact printer configuration via the male connector 86 or the female connector 87. Either the male or the female bayonet connector joins the Effects Module to the Serial Bus via contact strips 309. Power may be provided to the Effects Module from the Printer Module 10 via the Serial Bus.

Alternatively, the Effects Module may be connected to a compact printer configuration via both the male and female bayonet connectors. An example of this principle is shown in FIG 16 where the Memory Module 30 is connected via both its male and female connectors.

The Effects Module may be used to select an effect and then to apply that effect to the current image in the Printer Module 10 or in the Memory Module 30.

The LCD 82 provides feedback in the form of an effect type 321 and number 322, and an animated thermometer 323 that is shown while the effect is being applied to the image.

Pressing the CHOOSE button 83 cycles through the effect types. Each effect type has its own LCD icon and a current effect number. The effect types are borders, clip-art, captions, warps, color changes, and painting styles. These effects can be combined in any way and in any order.

Pressing the SELECT button 84 increments or decrements the effect number. The effect number is visible on the LCD screen. Ideally each effect type has 100 effects (although this is not strictly required). The Effects Module stores the current effect number for each effect type so that the next time the effect type is chosen, the previously used effect number is selected.

Once the desired effect type and effect number have been chosen, the effect can be applied to the image currently in the Printer Module 10 or Memory Module 30. This is done by pressing the APPLY button 85 below the LCD. As the image is being read, the effect applied, and resultant image written back, a series of animated segments appears on the left side of the LCD to form a thermometer-style status bar 323. The proportion of segments displayed is the proportion of the work that has been completed so far. The user knows that the effect has been applied once all the segments have been displayed.

Effects can also be applied to images external to the compact printer system. The Communications Module 40 allows the Effects Module 80 to be connected directly to a personal computer. The personal computer may then use the commands described above to command the Effects Module to apply a specific effect, or number of effects, to an image supplied from memory in the personal computer.

The user must consult a manual to determine the correspondence between effect and effect number.

To apply multiple effects to an image a user simply applies each effect one at a time. The order may be important if a specific end image is desired. For example, adding a border and then warping the image will produce a different result to warping the image followed by adding a border.

Image borders can range from simple white to elaborate and complex designs. Some borders incorporate the image, but the majority of borders and frames are straightforward, consisting of one image being overlaid over another.

Clip-art consist of photographic and stylized cartoon characters and images inserted into the image at a specific location. The characters and clip-art included in a general Effects Module would require little or no licensing. Examples include clowns, action figures, smiley faces, ugly faces, animals and specific objects.

Captions consist of speech bubbles, lines of text or other textual effects applied to an image. Examples include "Happy Birthday!", "How old are you?", "It was this big!", "Wow!", "Help!" .

No effort is made to interpret the image before the caption is added. For a given effect number a specific caption is added at a specific fixed place in the image.

Captions are overlaid as graphics. Therefore they can include anything and be in any language, any color combination, and be in multiple fonts. The user is unable

to change any part of the caption or style - the caption is simply added to the image. A choice between 100 captions is envisaged.

Images can be warped using the Warp effect type. Each warp effect number affects a fixed area of the image, which can be the entire image, or a limited part of the image. As with other effect modes, no effort is made to interpret the image before the warp is applied. For a given effect number, the specific warp is added at a specific fixed place in the image.

Some warps are specifically designed to affect a face image, although there is no specific face detection mechanism. Instead, the warp is applied to the part of the image where the face should be. For these warps, the effect is applied to the relevant part of the image irrespective of whether a face is present in that part of the image.

It is often desirable to transform an image in terms of color. Simple color effects include removal of color to produce a grey-scale image or a sepia tone image. More complex effects include exaggeration of certain colors, substitution of one color for another and the like.

The painting styles effect mode lets the user apply a painting style to an image. For example, an image can be changed into an impressionist drawing of the original, or drawn with a variety of brush strokes from a limited color palette. Painting styles also includes limited tiling effects.

These painting styles do not utilize lighting calculations. Certain types of metallic or bump-map based painting effects are therefore not possible.

As mentioned above, an application specific integrated circuit (ASIC) may be configured as the Effects Module Central Processor (EMCP) 350. The elements of the EMCP 350 are shown in FIG 19. The elements of the EMCP are described in detail in a co-pending application titled Effects Processor for Effects Module. It is envisaged that alternatives to an ASIC known in the art, such as a VLSI, may be used to configure the EMCP.

The EMCP 350 is a single chip containing a standard RISC processor core 351 with DSP 352 for fast integer multiplication and a small memory. The EMCP 350 includes a ROM 353 for software and data storage and RAM 354 for variable storage. Bus interface 355 communicates with the Serial Bus for transfer of an image to and from the Effects Module 80.

Also included in the EMCP is a memory decoder 356 and parallel interface 357 (that communicates with the LCD and various buttons).

The EMCP need not contain memory for storing an image since the image is retrieved from an image source, has the effect applied and is returned to the image source. Nonetheless, local memory may be provided for image storage if desired.

The software running on the EMCP is a limited subset of the VARK language and a lookup table of VARK scripts as described in co-pending United States Patent Applications whose USSNs are as follows:

USSN	TITLE
09/113,060	Digital Instant Printing Camera with Image Processing Capability
09/113,070	Image Transformation Means Including User Interface
09/112,777	Producing Automatic "Painting" Effects in Images
09/113,224	Digital Image Warping System
09/112,804	Digital Image Region Detection Method and Apparatus
09/112,805	Brush Stroke Palette Feedback Method for Automatic Digital "Painting" Effects
09/112,797	Utilising of Brush Stroking Techniques in the Generation of Computer Images
09/113,071	Camera System with Computer Language Interpreter
09/113,091	Bump Map Compositing for Simulated Digital Painting Effects
09/112,753	Production of Artistic Effects in Images Utilising Restricted Gamut Spaces
09/113,055	Utilisation of Image Tiling Effects in Photographs
09/113,057	Utilisation of Image Texture Mapping in Photographs
09/113,054	Utilisation of Image Illumination Effects in Photographs

Since the effects are coupled with the VARK implementation, there is no specific future-proofing required.

The combination of the Effects Module 80 with the Printer Module 10 constitutes a minimum compact printer system that allows one or more effects to be applied to an image stored in the Printer Module and printed directly. The combination of the Memory Module 30 with a Camera Module 20 constitutes a digital imaging system. This combination allows an image captured by the Camera Module to be stored in the Memory Module.

Throughout the specification the aim has been to describe the preferred embodiments of the invention without limiting the invention to any one embodiment or specific collection of features. Persons skilled in the relevant art may realize variations from the specific embodiments that will nonetheless fall within the scope of the invention.

## CLAIMS

1. An effects module comprising:  
a body;  
an image processor within said body that applies one or more effects to a  
stored image;  
at least one connection means incorporated in said body for connecting said  
effects module to a bus providing power and data between said effects module  
and said stored image.
2. The effects module of claim 1 having two or more connection means  
incorporated in said body, at least one connection means connecting said  
effects module to at least said stored image.
3. The effects module of claim 1 having two or more connection means  
incorporated in said body including a first connection means connectable to  
said stored image and a second connection means connectable to further  
modules in a stackable manner.
4. The effects module of claim 1 having two or more connection means  
incorporated in said body, said two or more connection means providing  
through connection to said stored image and one or more further modules of a  
compact printer system.
5. The effects module of claim 1 wherein the image processor includes means for  
retrieving the stored image from a first image store, means for applying said  
one or more effects to said stored image, and means for transferring a resultant  
image to a second image store.
6. The effects module of claim 1 further comprising a LCD within said body,  
said LCD being connected to said image processor and providing information  
about said effects.
7. The effects module of claim 6 wherein said LCD is capable of displaying a  
plurality of icons indicative of effect type, effect number and effect application  
status.
8. The effects module of claim 1 further comprising a CHOOSE button to cycle  
through a plurality of effect types.
9. The effects module of claim 1 further comprising a SELECT button to  
increment or decrement an effect number.

10. The effects module of claim 1 further comprising an APPLY button to apply a selected effect to said stored image.
11. The effects module of claim 1 wherein said effects are borders, clip-art, captions, warps, color changes, and painting styles.
- 5 12. The effects module of claim 1 wherein said at least one connection means comprises a male bayonet fitting providing physical connection between said effects module and a module storing said stored image.
13. The effects module of claim 1 wherein said at least one connection means comprises a female bayonet fitting providing physical connection between  
10 said effects module and a module storing said stored image.
14. The effects module of claim 1 wherein said bus is a Serial Bus.
15. The effects module of claim 1 wherein said bus enables said effects module to be controlled externally allowing said one or more effects to be applied to external stored images.
- 15 16. An effects module for a compact printer system comprising:  
a body;  
an image processor within said body that applies one or more effects to an image stored in a further module of said compact printer system;  
at least one connection means incorporated in said body for connecting said  
20 effects module to a bus providing power and data between said effects module and said further module.
17. The effects module of claim 16 wherein said further module is a printer module.
18. The effects module of claim 16 wherein said further module is a memory  
25 module.
19. A method of applying one or more effects to a stored image in a compact printer system comprising the steps of:  
reading said stored image from a first storage location to an image processor;  
applying a selected effect to said stored image;  
30 writing a resultant image to a second storage location.
20. The method of claim 19 wherein said first storage location and said second storage location is a printer module of said compact printer system.

21. The method of claim 19 wherein said first storage location is a memory module of said compact printer system and said second storage location is a printer module of said compact printer system.

PP11US

## ABSTRACT

An effects module useful in a digital imaging system such as a compact printer system. The effects module includes an image processor that applies one or more effects to a stored image, which may be read from a printer module. The resultant  
5 image is written back to the printer module or another module able to store images. The effects module preferably incorporates two connection means. One or other of the connection means may connect to corresponding connection means on the printer module. The connection means includes a physical connection and a logical connection. The logical connection is a serial bus that communicates power and data.

10 Buttons are provided to choose, select and apply different types and numbers of effects to the image read from the printer module. Feedback is provided via a LCD.

PP11US



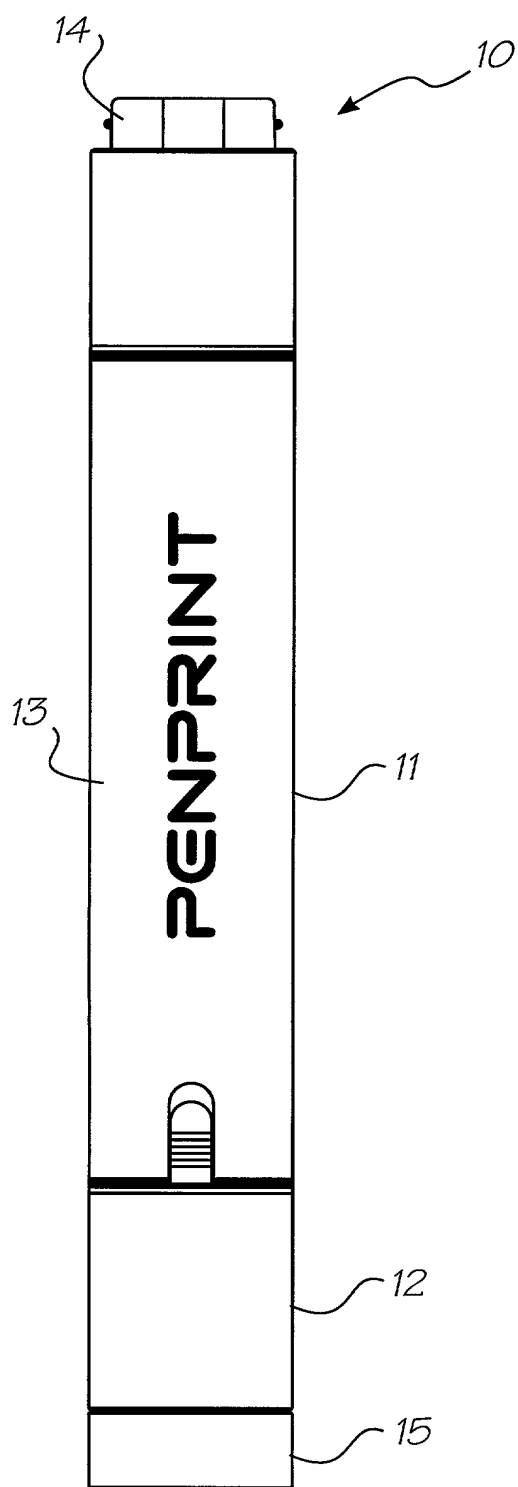


FIG. 1

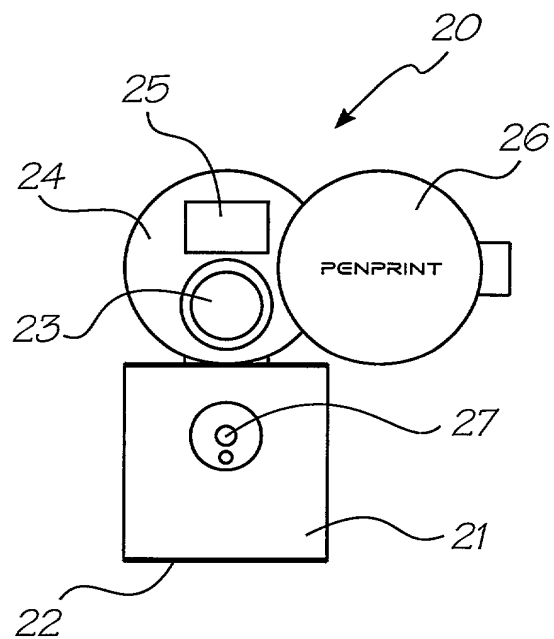


FIG. 2

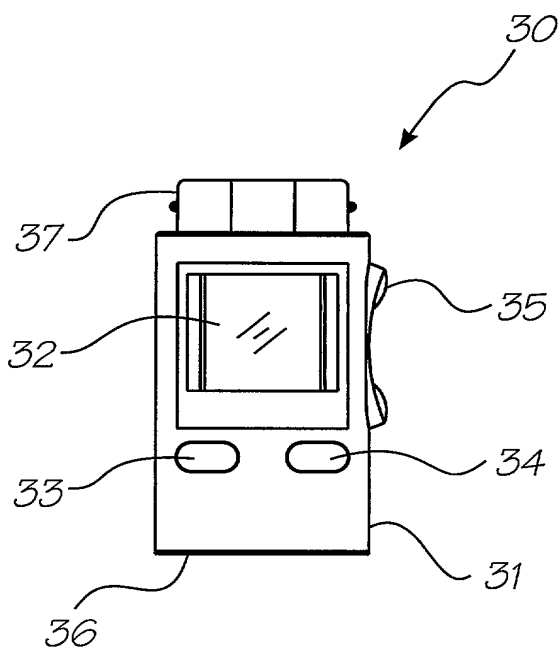


FIG. 3

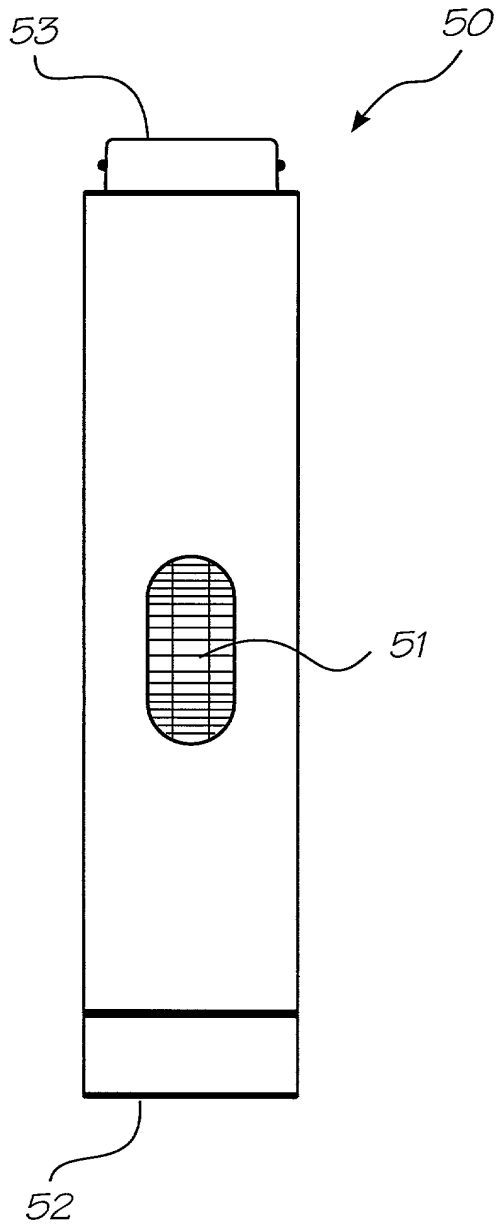


FIG. 5

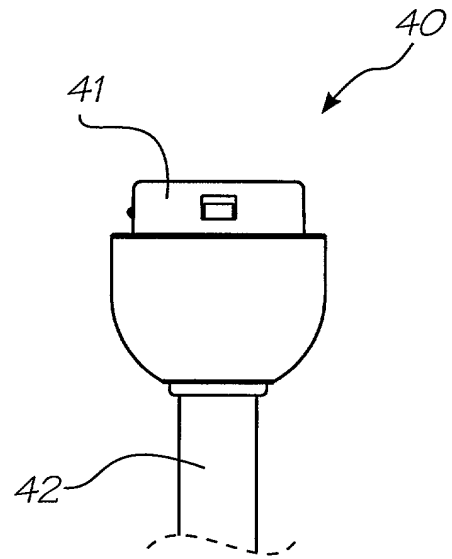


FIG. 4

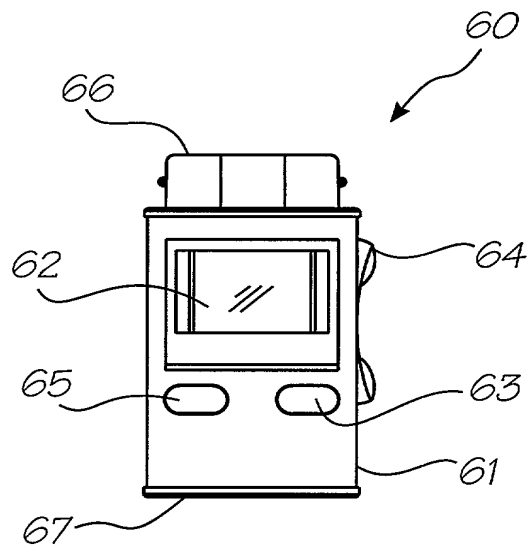


FIG. 6

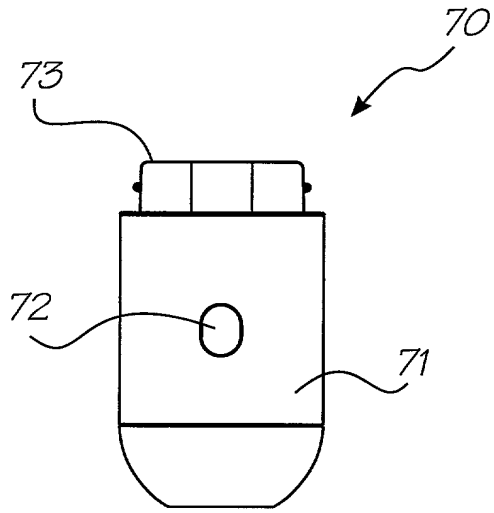


FIG. 7

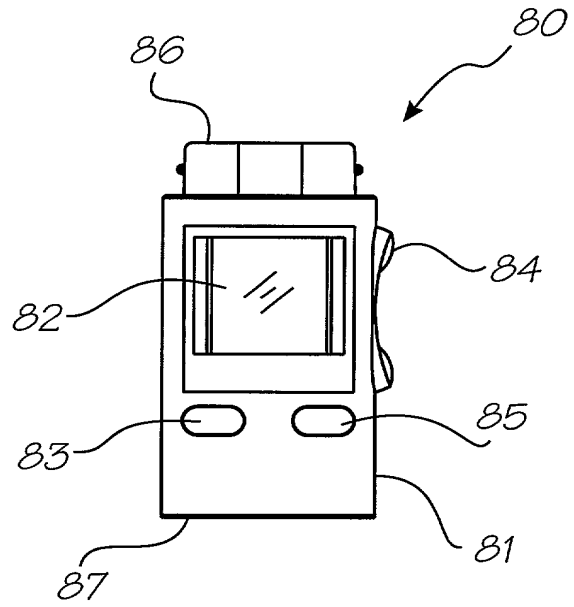


FIG. 8

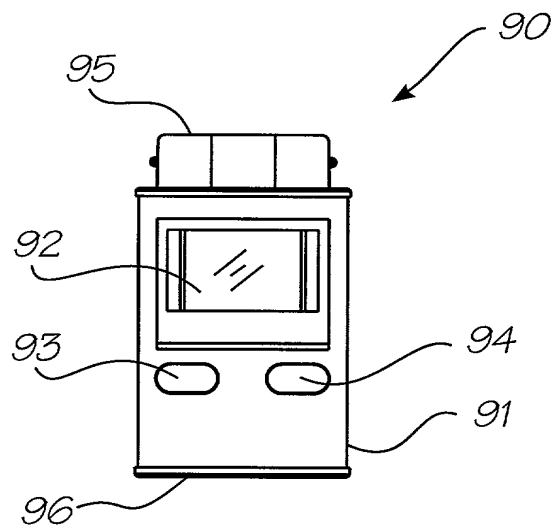


FIG. 9

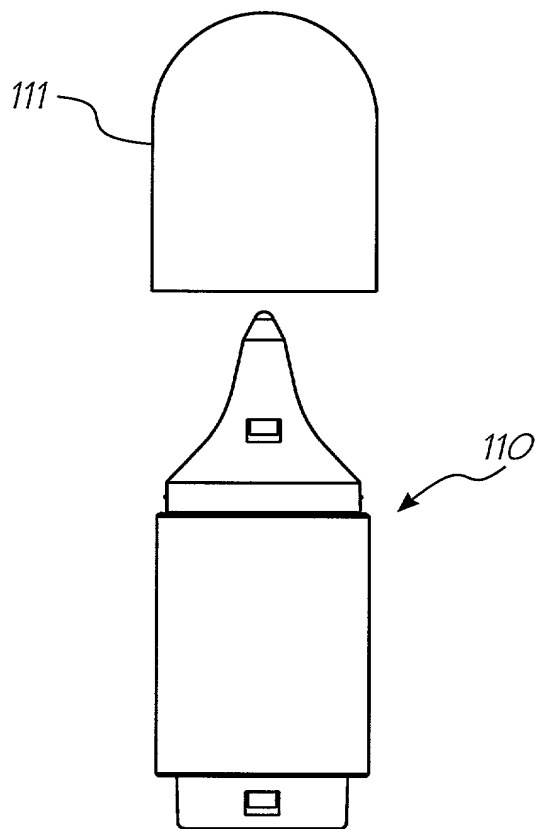


FIG. 11

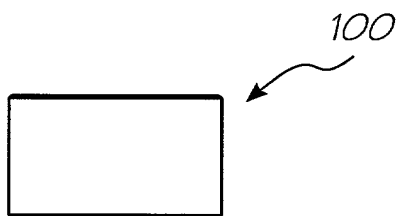


FIG. 10

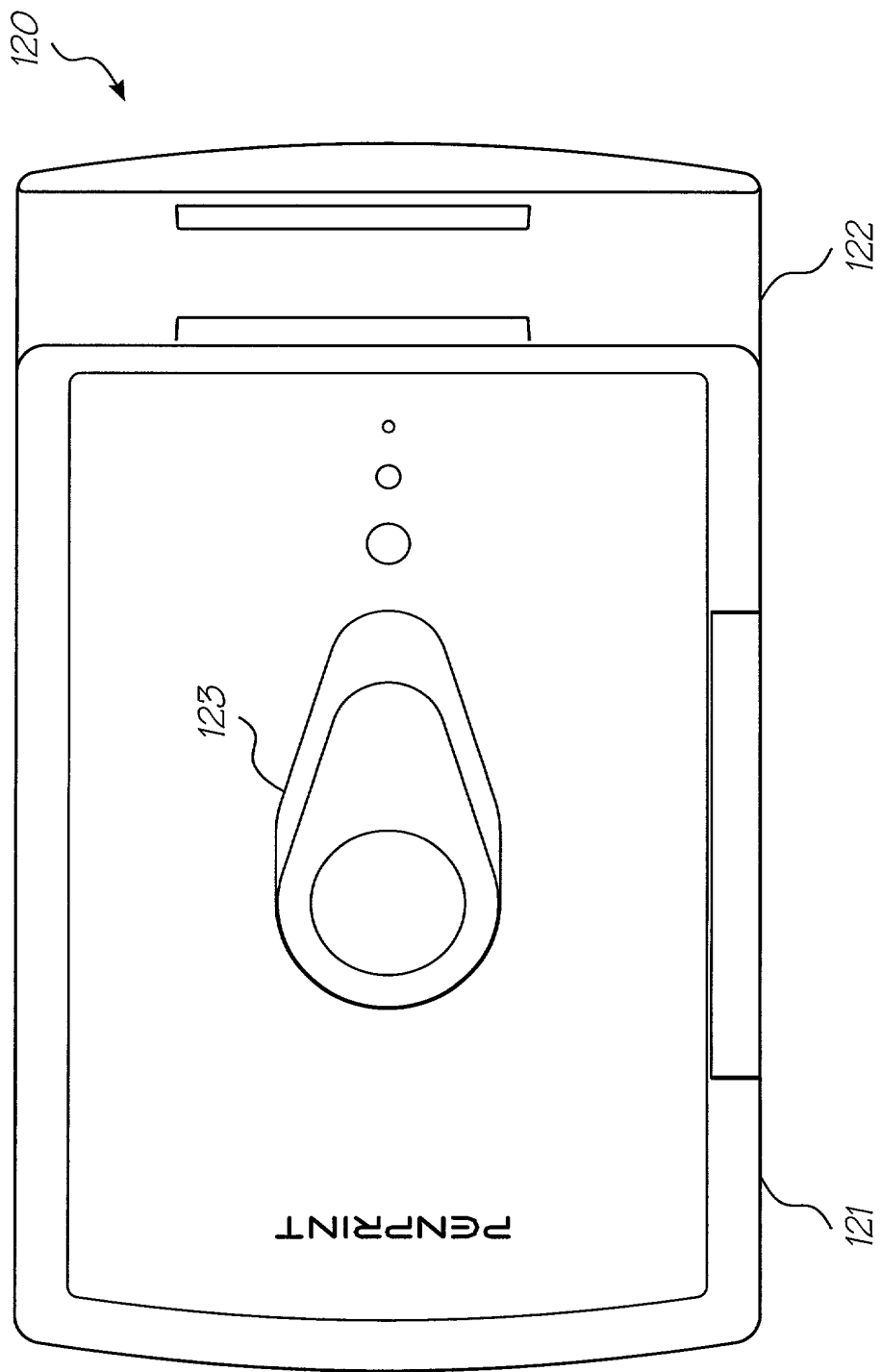


FIG. 12

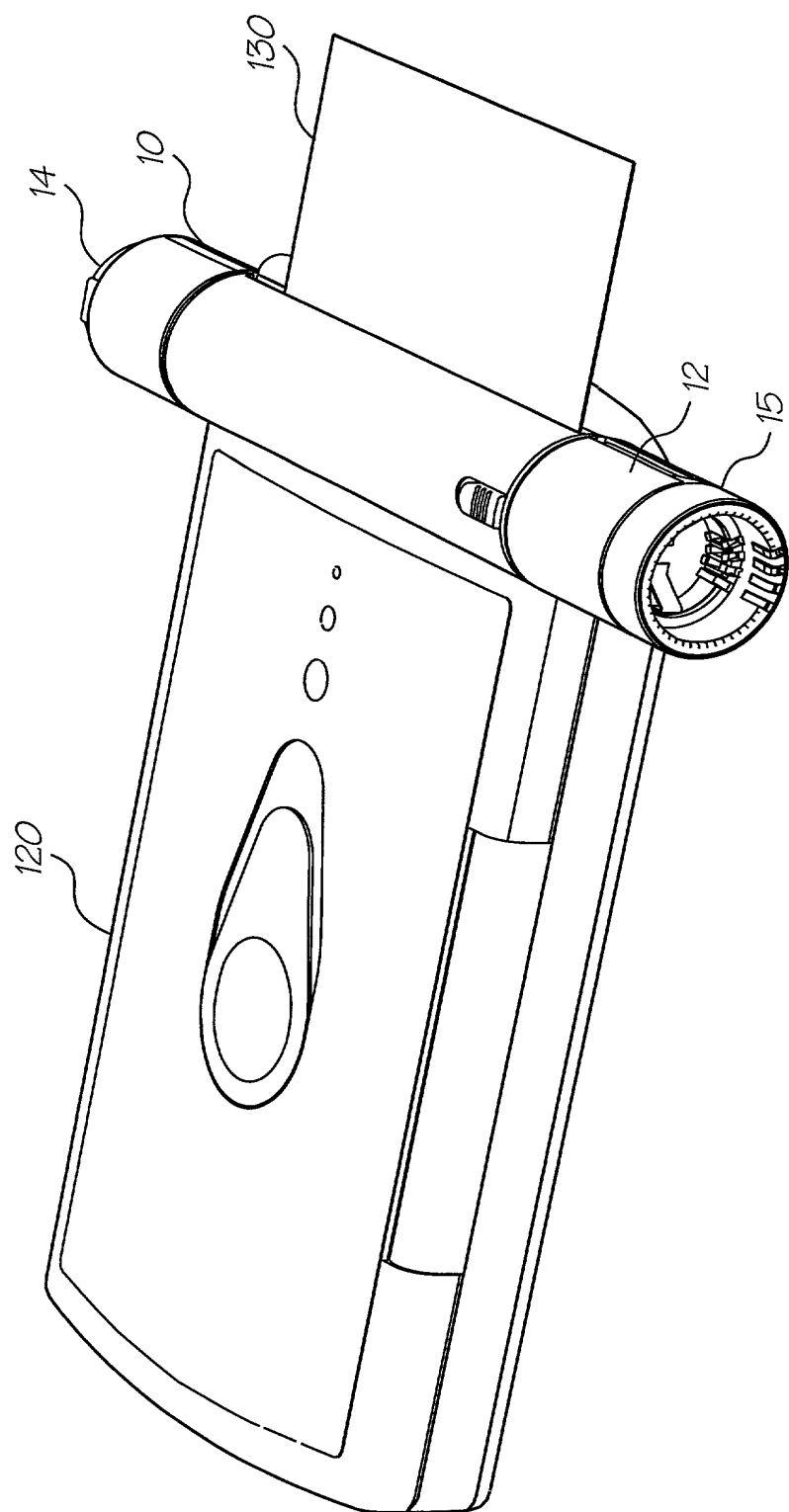


FIG. 13

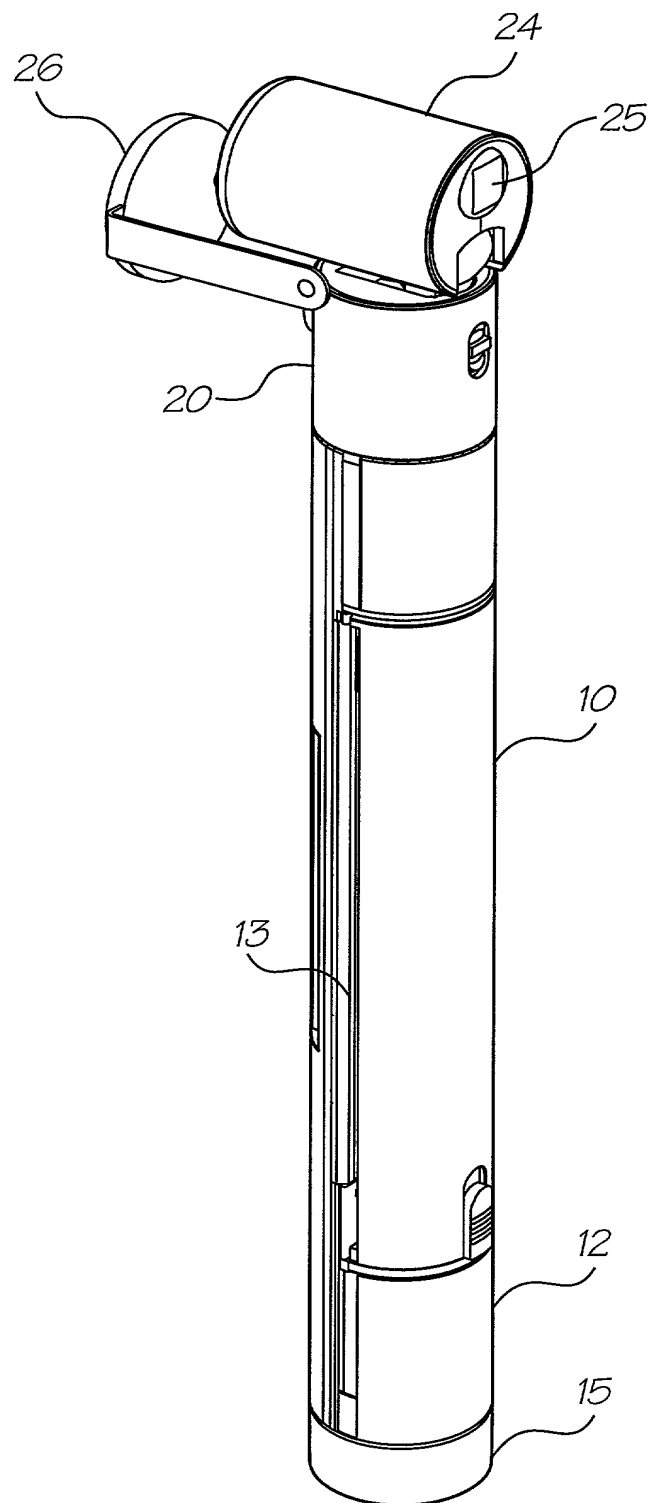


FIG. 14

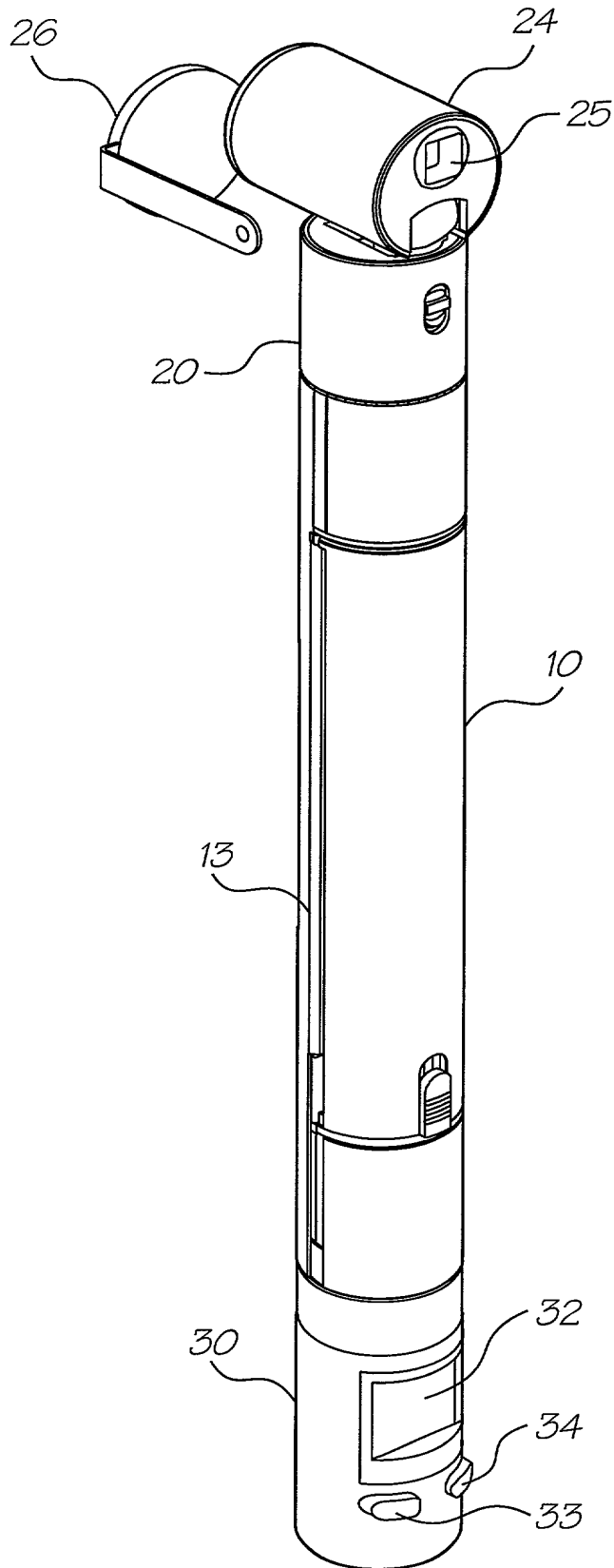


FIG. 15



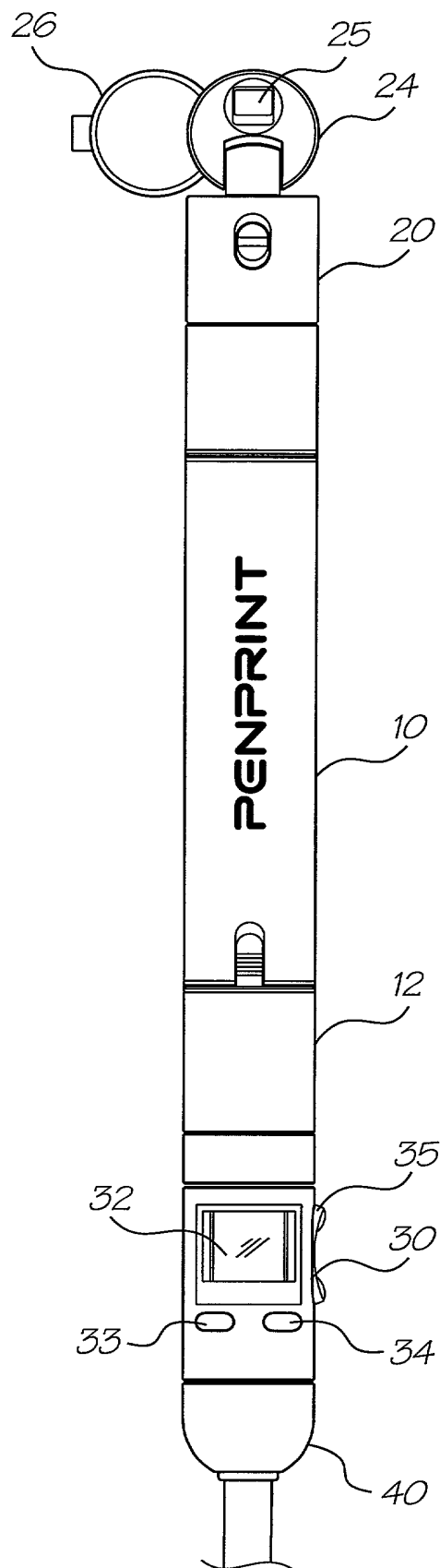


FIG. 16

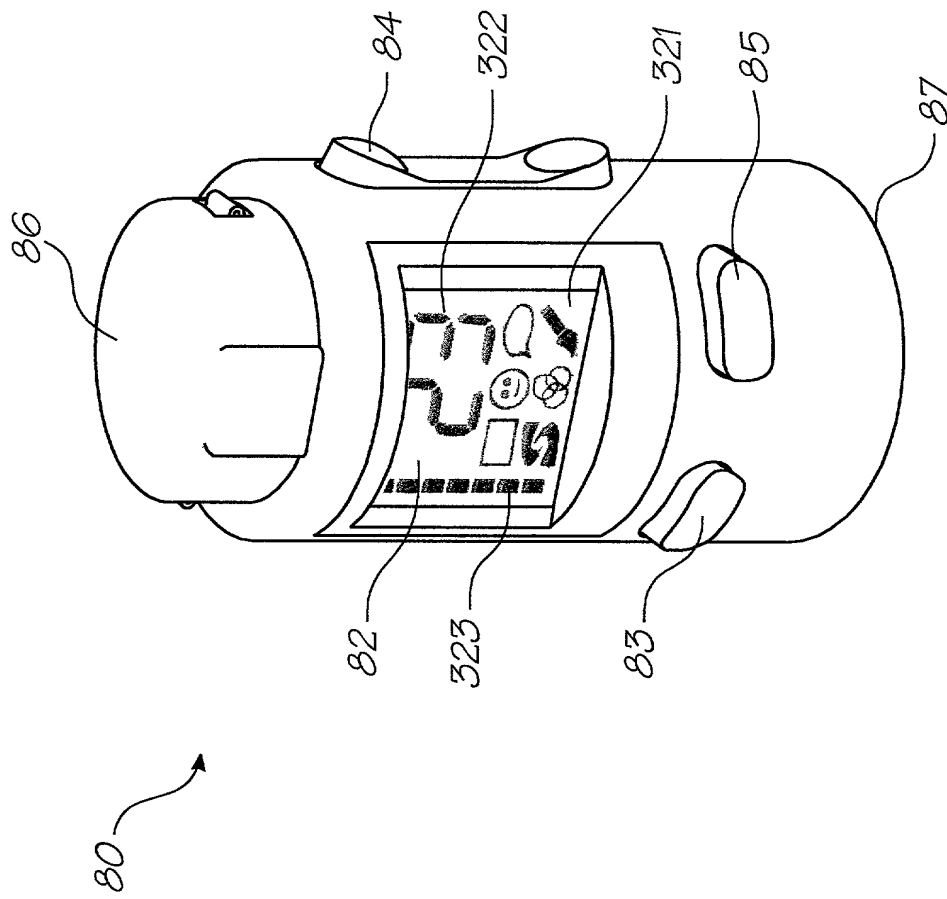


FIG. 17

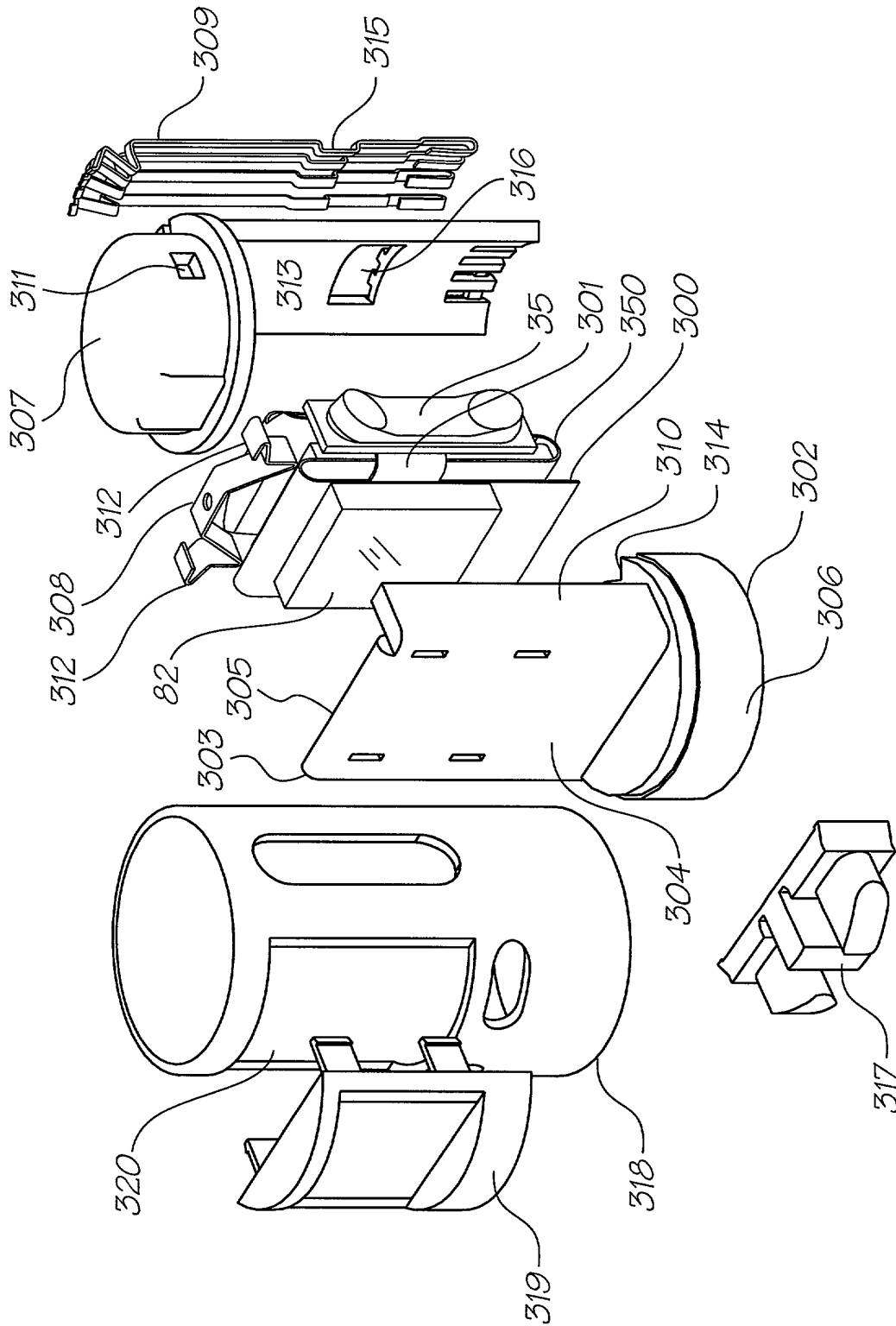


FIG. 18

continued on next page

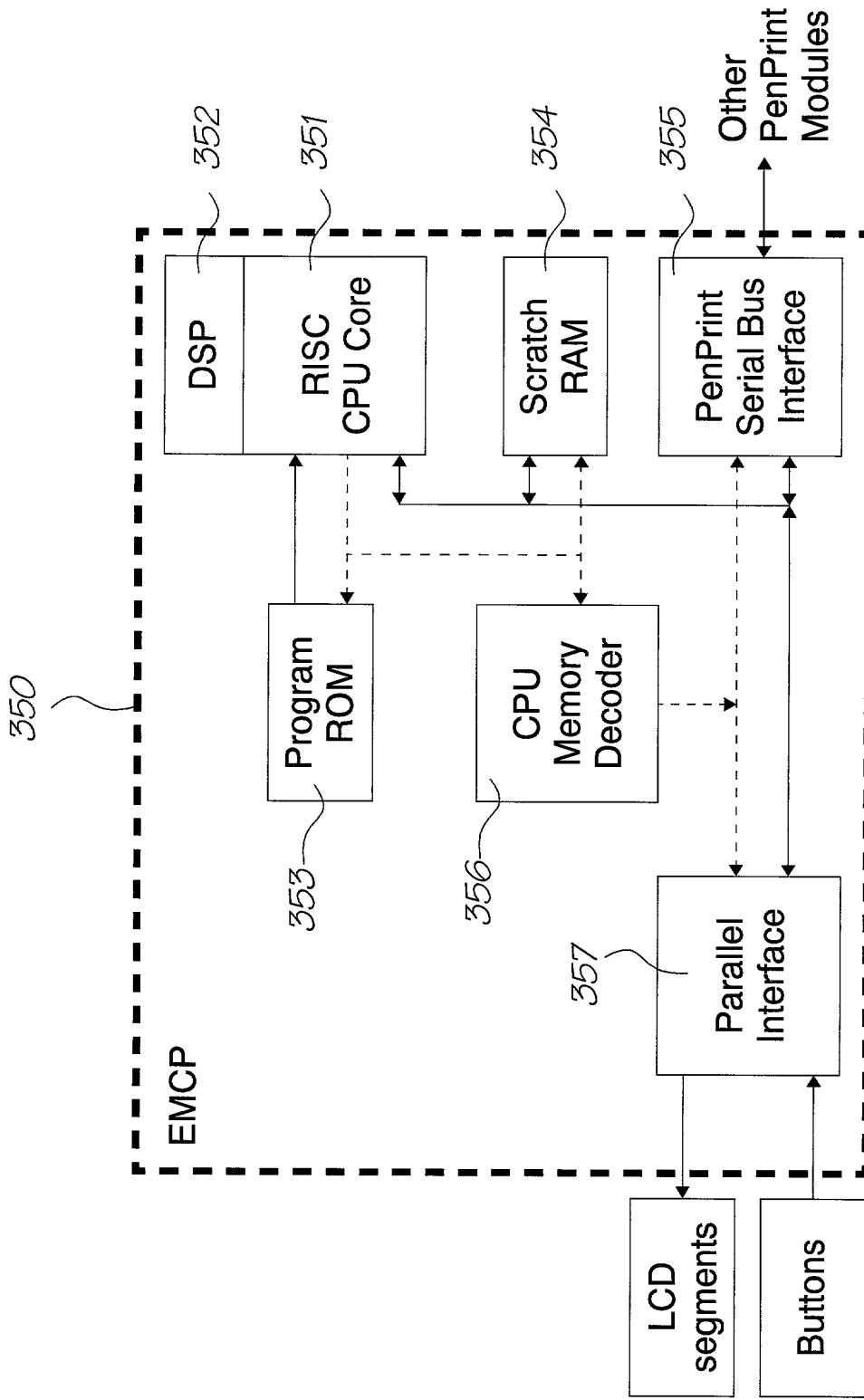


FIG. 19

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<b>DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION</b> <b>(37 CFR 1.63)</b>	<b>Attorney Docket Number</b>	PP11US
	<b>First Named Inventor</b>	Kia Silverbrook
	<b>COMPLETE IF KNOWN</b>	
	<b>Application Number</b>	/
	<b>Filing Date</b>	
	<b>Group Art Unit</b>	
<input checked="" type="checkbox"/> Declaration Submitted with Initial Filing	OR	<input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)
	<b>Examiner Name</b>	

**As a below named inventor, I hereby declare that:**

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

EFFECTS MODULE FOR COMPACT PRINTER SYSTEM

the specification of which (Title of the Invention)

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY)  as United States Application Number or PCT International Application Number  and was amended on (MM/DD/YYYY)  (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PQ0560	Australia	05/25/1999	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)
<input type="text"/>	<input type="text"/>

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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**DECLARATION — Utility or Design Patent Application**

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U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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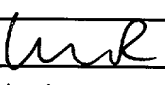
Name	Registration Number	Name	Registration Number

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☒ Customer Number  OR ☐ Correspondence address below

Name	Kia Silverbrook				
Address	Silverbrook Research Pty Ltd				
Address	393 Darling Street				
City	Balmain	State	NSW	ZIP	2041
Country	Australia	Telephone	61-2-9818-6633	Fax	61-2-9818-6711

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<b>Name of Sole or First Inventor:</b>		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Kia		Silverbrook	
Inventor's Signature		Date	May 16, 2000
Residence: City	Balmain	State	NSW
Country	Australia	Citizenship	Australian
Post Office Address	393 Darling Street		
Post Office Address			
City	Balmain	State	NSW
ZIP	2041	Country	Australia


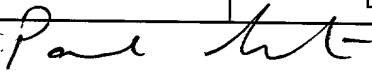
☒ Additional inventors are being named on the \_\_\_\_\_ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

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PTO/SB/02A (3-97)  
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**DECLARATION**
**ADDITIONAL INVENTOR(S)**  
**Supplemental Sheet**  
 Page 1 of 1

<b>Name of Additional Joint Inventor, if any:</b>				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
Simon Robert				Walmsley			
Inventor's Signature						Date	May 16, 2000
Residence: City	Epping	State	NSW	Country	Australia	Citizenship	Australian
Post Office Address	Unit 3, 9 Pembroke Street						
Post Office Address							
City	Epping	State	NSW	ZIP	2121	Country	Australia
<b>Name of Additional Joint Inventor, if any:</b>				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
Paul				Lapstun			
Inventor's Signature						Date	May 16, 2000
Residence: City	Rodd Point	State	NSW	Country	Australia	Citizenship	Norwegian
Post Office Address	13 Duke Avenue						
Post Office Address							
City	Rodd Point	State	NSW	ZIP	2046	Country	Australia
<b>Name of Additional Joint Inventor, if any:</b>				<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])				Family Name or Surname			
Inventor's Signature						Date	
Residence: City		State		Country		Citizenship	
Post Office Address							
Post Office Address							
City		State		ZIP		Country	

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